A New Fossil Land Snail of the Genus *Hemitrochus* from Bowden, Jamaica[1]

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ABSTRACT

A new species of *Hemitrochus*, *H. bowdenensis*, is described from a collection made in the Bowden Beds at Bowden, Jamaica. The species differs from its nearest relative *H. graminicola* (the only modern *Hemitrochus* found in Jamaica) on the basis of shell sculpture, the shape of the whorls, and umbilical width. Analysis of amino acid D/L ratios from one specimen indicates a late Holocene age for the sample and that therefore the material does not belong stratigraphically to the Bowden Beds (of early Pliocene age). The species is apparently extinct, probably as a result of either habitat destruction following European settlement or late Holocene climatic changes.

Key words: land snail, fossil, new species, Jamaica, *Hemitrochus*, Bowden.

INTRODUCTION

The Bowden Beds, located near Bowden, St. Thomas Parish, in southeastern Jamaica, have yielded an extremely rich marine mollusk fauna (Woodring, 1925, 1928) as well as a number of land snails, including a species of helicinid of the genus *Lucidella* (Simpson, 1895), three species of poteriids (Simpson, 1895; Bartsch, 1942; Morrison, 1955), and two species of camaenids of the genus *Pleurodonte* (Simpson, 1895; Kimball, 1947). Various other land snail species have been mentioned as having been collected from the Bowden Beds ("*Thysanophora*", *Opeas striata*, *Succinea latior*; Simpson, 1895; "*Stenogyra*", "*Melaniella*", "*Truncatella*"; Woodring, 1928), but because of the fresh appearance of some of these shells, it has been suggested (Woodring, 1928) that these may be recent material washed into the Bowden sediments. The Bowden Beds are considered to be of early Pliocene age based on analysis of the foraminiferal fauna (assigned to the *Globorotalia margaritae* zone by Bolli and Bermudez (1965), which was placed in the early Pliocene by Bolli and Premoli Silva (1973)). Recent work on marine mollusks from Bowden has accepted this age assignment (Jung, 1989).

Examination of the collections at the Academy of Natural Sciences of Philadelphia (ANSP) has turned up a new species of land snail collected from the Bowden Beds and belonging to the family Helminthoglyptidae (= Xanthonycidae *sensu* Baker (1943) and Nordsieck (1987); = Fruticicolidae *sensu* Turner (1958)). This new species is described below and its relationships are discussed.

Hemitrochus bowdenensis new species

Description: Shell of average size for the genus (*ca.* 11–12 mm diameter), low-trochoidal (height ⅔ of diameter), moderately thin; spire weakly convex; shell periphery subangular, becoming nearly rounded at the lip; suture deeply impressed; base weakly convex, with the apex of the convexity shifting from a position in the middle of the base in the younger part of the shell to a position nearer to the umbilicus (than to the periphery) as the adult lip is approached; descent of the suture behind the lip unknown, since the upper part of the lip is not preserved in the specimens; lip unreflected at periphery but gradually becomes reflected on the base in the direction of the umbilicus; bordering the umbilicus, the lip is strongly reflected, but only for a short distance, whereas in the middle of the base of the shell, the lip reflection starts earlier but is weaker; the basal insertion of the lip is drawn out, forming a rim on one side of the umbilicus which is reflected over a small part of the umbilicus; aperture round to weakly elliptical, with the width usually slightly exceeding the height; protoconch 1.6–1.7 whorls, smooth; the sculpture of later whorls consists of

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Table 1. Measurements of the type material of *Hemitrochus bowdenensis*.

Specimen	Life history stage	Diameter (mm)	Height (mm)	Height/ diameter	Whorl number	Aperture width (mm)	Aperture height (mm)	Aperture height/ width
Holotype	adult	12.4[1]	8.3	0.67	4.5	5.2[2]	4.9[2]	0.94[2]
Paratype	subadult	10.5[1]	6.9	0.66	4.4	4.6	4.6	1.00
Paratype	?juvenile	8.6	5.5	0.64	4.0	3.9	3.8	0.97

[1] Diameter is the approximate adult diameter; a precise measurement is not possible since the lip is broken.
[2] Measured 0.1 whorl behind aperture, due to broken lip.

low, broad ribs (*ca.* 12–14 on the penultimate ¼ whorl) that are parallel to the growth lines and irregular, with each rib varying in both height and width along its length; the length of the ribs also varies, with some disappearing on the dorsum of the shell, and others continuing across the periphery and terminating just below the periphery; on the rest of base, sculpture consists only of irregular growth lines, which get stronger nearer the lip; color opaque white. Measurements of specimens are presented in Table 1.

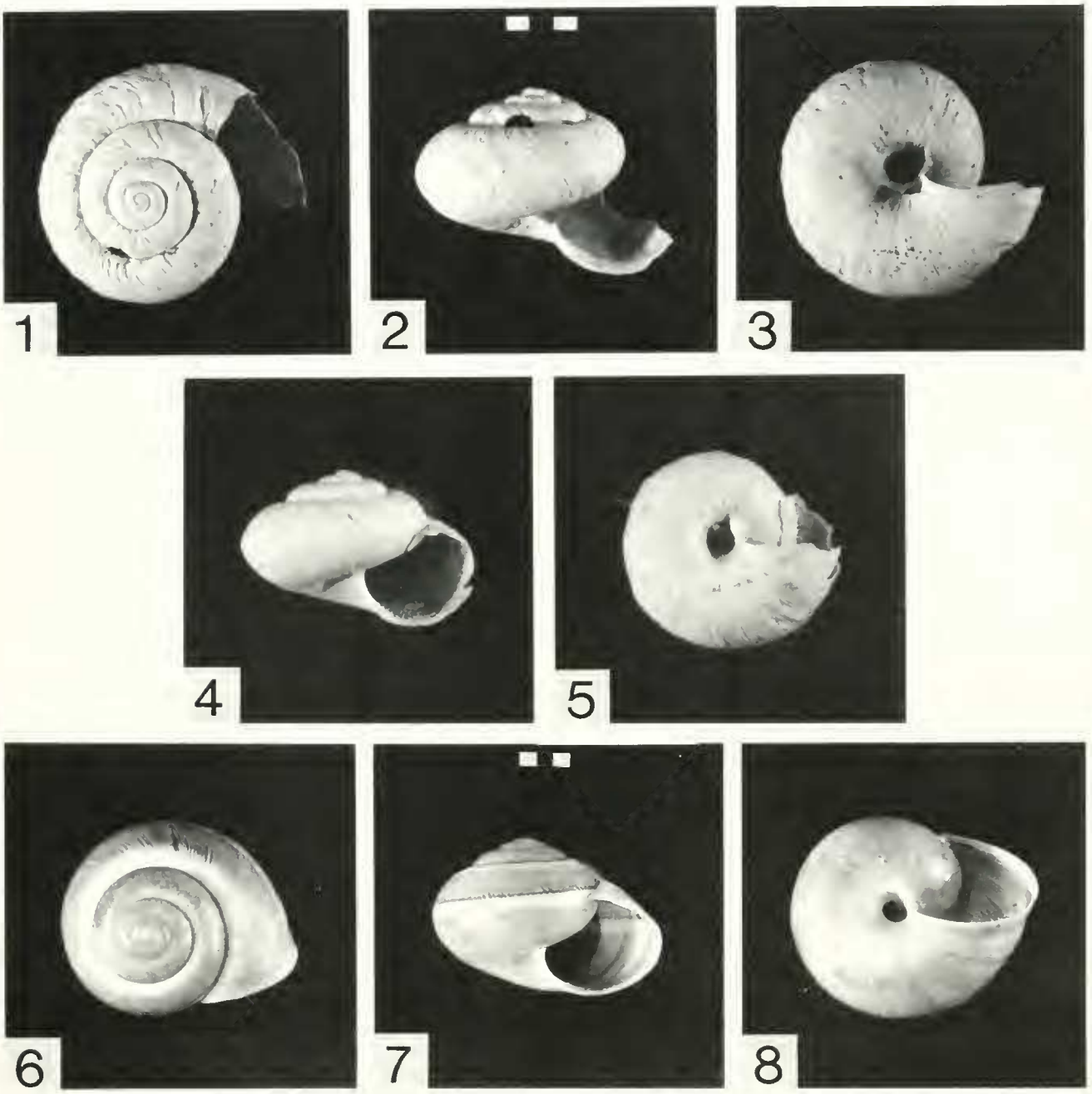
Material examined: The holotype (ANSP 75798) and two paratypes (ANSP 75799) are the only known specimens of this species. The holotype (figures 1–3) is an adult shell missing the upper lip and the end of the lip where it becomes the umbilical wall. The first paratype (figures 4, 5) is apparently a subadult specimen. The lip shows the reflection which characterizes the adult form but the lip is a little thinner than that of the holotype, suggesting that the shell is not fully mature. The dimensions of the shell should be representative of the adult dimensions, since further growth would result only in thickening of the shell. The upper lip of this specimen is broken as in the holotype but the umbilical end of the lip is intact. The second paratype has the last *ca.* 1 whorl missing, the remains of which can be seen only as a rim around the umbilicus. An additional *ca.* ¼ of the upper part of the last whorl was originally present but was removed for amino acid analysis.

Type locality, stratigraphy, and collection information: The locality data provided with the material indicates that it was collected "Among oligocene fossils, Bowden, Jamaica", by Uselma C. Smith and S. L. Schumo. Bowden is a small village located on the east side of Port Morant Bay in southeastern St. Thomas Parish, Jamaica. No stratigraphic information is provided with the material. However, concerning the well-known Bowden fossil beds (later considered to be Miocene in age; Woodring, 1928), Woodring (1925:7) stated that "At the type locality [*i.e.*, at Bowden] a bed of imperfectly consolidated gravel consisting of small pebbles and grains of igneous rocks, limestone, and other sorts of rock in a marly matrix crops out in the road-cut for a distance of several hundred feet along the bay. This bed, which is not more than 2 or 3 feet thick, contains perfectly preserved fossils, and, so far as known, has furnished all the fossils collected at Bowden." Chubb (1958:28) indicates that at Bowden there is "one bed, some 2–3 feet thick lying a few feet above road-level, of unconsolidated gravel consisting of small pebbles and grains of igneous rocks in a marly matrix. The bed is lenticular and runs for only about a couple of hundred yards, and it is extremely rich in well-preserved fossils. . . ." The land snail material was among an extensive collection of marine mollusks made by Smith and Schumo and it seems almost certain that all this material was collected from the locality described by Woodring and by Chubb. In a visit to Bowden by the author in April, 1991, it was found that the beds containing marine mollusks run along the roadcut on the east side of the Bowden road, northward from the junction of the road climbing up the hill from Bowden. This should be taken as the type locality for *Hemitrochus bowdenensis*.

No date of collection is associated with the Schumo and Smith collection from Bowden, but the catalogue at the Academy of Natural Sciences of Philadelphia indicates that this material was presented to the museum on January 7, 1902 (G. Rosenberg, personal communication), so it was collected some time before this date.

Comparative remarks: The only other helminthoglyptid genus found in Jamaica is *Dialeuca*. The shells in this genus differ from *Hemitrochus* shells in several respects. The umbilicus (covered in adults) is very narrow and the basal lip inserts at a high angle to the columella (in *Hemitrochus* this insertion is at a low, near vertical angle); these features, together with a higher expansion rate of the last whorl, result in the aperture being considerably wider than high. The basal lip expands gradually and evenly across the base (this also occurs in some Bahamian *Hemitrochus* species) and the dorsal lip is reflected. The sculpture consists only of weak growth lines (this occurs also in some Bahamian *Hemitrochus* species). The ribbed sculpture characteristic of most species of *Hemitrochus* occurs also in *Plagioptycha*, a genus found in Hispaniola, the Bahamas, and the Lesser Antilles. But *Plagioptycha* differs from *Hemitrochus* in having a high-angle insertion of the basal lip onto the columella (as in *Dialeuca*) associated with a relatively wide aperture; the shell is more depressed and a ridge is usually present on the inside of the lower lip on the left (umbilical) side. Thus the new species clearly belongs in *Hemitrochus* rather than in a related helminthoglyptid genus.

Hemitrochus bowdenensis most closely resembles the only other *Hemitrochus* species inhabiting Jamaica, *H.*



Figures 1–3. *Hemitrochus bowdenensis* new species, dorsal, apertural, and ventral views of holotype. **4, 5.** *Hemitrochus bowdenensis* new species, apertural and ventral views of paratype. **6–8.** *Hemitrochus graminicola* (from Happy News, SE of Alexandria, St. Ann, Jamaica), dorsal, apertural, and ventral views. Scale line (in mm) in figure 2 refers to figures 1–5 and scale line in figure 7 refers to figures 6–8.

graminicola (C. B. Adams). *H. graminicola* (figures 6–8) differs in having a more weakly developed sculpture consisting of fine, regular ribs (*ca.* 30 on the penultimate ¼ whorl) which cross the base of the shell, disappearing only near the umbilicus. It also differs in having a rounded periphery on the whole of the last whorl, a more inflated base, less impressed sutures, and a generally larger size (12–16 mm diameter). However, in the form of the lip reflection and in the shift of the apex of the basal convexity toward the umbilicus in the direction of the lip, *H. bowdenensis* resembles *H. graminicola* precisely. *H. pseudogyra* (Torre) from Cuba closely resembles *H. graminicola* but is less close to *H. bowdenensis* in that its sculpture is both weaker and finer than that of *H. graminicola*. It should be emphasized that, although these are the species nearest phenotypically to *H. bowdenensis*, they are not very closely related to it—the character of the sculpture of *H. bowdenensis* is altogether different

Table 2. D L amino acid ratios in paratype specimen of *Hemitrochus bowdenensis*.

Amino acid	D/L
Alanine	0.12
Alloisoleucine/isoleucine	0.053
Proline	0.33
Aspartic acid	0.27
Methionine	0.24
Glutamic acid	0.062
Phenylalanine	0.14

from that of any modern species. *H. bowdenensis* is not banded as other *Hemitrochus* species are. The lack of banding on the shells could possibly be the result of fading, but this seems unlikely for such young material.

Hemitrochus has been considered a subgenus of *Cepolis* (Pilsbry, 1939; Baker, 1943), but Turner (1958) raised it to generic status on the basis of anatomical characteristics. Although the earlier inclusion of *Hemitrochus* within *Cepolis* was retained by Nordsieck (1987) and Vaught (1989), the taxonomy of Turner (1958) is followed here.

AGE OF THE SAMPLE

Although the Bowden Beds are considered to be of early Pliocene age, the possibility of inclusion of some modern material in the collections still exists, for example if material were collected from slumped sediments which could have incorporated modern terrestrial shells or from exposed fissure infills. Woodring (1928) considered that some of the land snail material that had been collected from the Bowden Beds may have been modern, stating that some of the material may represent "the remains of living snails that fell into openings in the ground and thus were collected with the fossil material" (p. 109). Because of this possibility, amino acid enantiomer/epimer analyses were carried out on a fragment of one of the *H. bowdenensis* shells as a check on its age (see Goodfriend, 1991, for analytical methods). Material of early Pliocene age would be expected to give D/L amino acid ratios near equilibrium (1.3 for D-alloisoleucine/L-isoleucine and 1.0 for other D/L amino acid ratios) and may be highly depleted in amino acid content.

The analytical results (Table 2) indicate that the *Hemitrochus* shell is relatively young. As would be expected, faster-racemizing amino acids such as aspartic acid, proline, methionine, and phenylalanine (Goodfriend, 1991) show higher D/L ratios than the slower racemizing/epimerizing amino acids glutamic acid and isoleucine. A calibration of the rate of isoleucine epimerization in *Pleurodonte* during the Holocene at a site on the north coast of Jamaica (Goodfriend and Mitterer, 1988) leads to an age estimate based on the alloisoleucine/isoleucine (A/I) ratio of the *Hemitrochus* of 1700 year B.P. (assuming an initial A/I value of 0.013, as is typical of modern land snail shells). This estimate is very approximate since there are a number of errors involved which compound to produce the total error: the error of measurement of the A/I ratio of the *Hemitrochus* sample (5–10%), possible differences in the epimerization rate between different genera (usually on the order of 10%), and, most importantly, the uncertainty of the rate difference between Bowden and the north coast calibration site. For example, a 2° difference between the sites would lead to a 40% difference in the epimerization rates (equation 3 in Goodfriend and Mitterer, 1988). Allowing a total uncertainty of ±50% would indicate a probable age between 800–2400 year B.P. Thus it is clear that the sample is of late Holocene age, and therefore represents material which does not belong to the Bowden Beds. A visit to the Bowden Bed type locality revealed that the mollusk-containing unit was in many cases covered by colluvial material, slumped down from the steep slope above. It seems likely that the *H. bowdenensis* material was collected from such a slumped deposit, perhaps at the same level as the mollusk beds.

DISCUSSION

This new species of *Hemitrochus* is not represented in modern collections from Jamaica and is therefore presumably extinct. Whether this presumed extinction was the result of forest clearance subsequent to European settlement of Jamaica or occurred before this time, as a result of natural processes such as climatic change, cannot be ascertained without additional dated records of this species. Evidence of human induced local extirpations of land snail species exists for the north coast of Jamaica (Goodfriend and Mitterer, 1988). But climatic changes in the late Holocene have also been documented in Jamaica (Goodfriend, 1987).

The occurrence of this apparently extinct species in the recent fossil record of Jamaica is somewhat surprising in view of the fact that other Holocene and late Pleistocene deposits on the island contain only extant species (Goodfriend and Mitterer, 1988; Goodfriend, 1989). Recent extirpations of species in north-central Jamaica (Goodfriend, 1987) and the central north coast of Jamaica (Goodfriend and Mitterer, 1988) have been noted, but these species have survived elsewhere on the island. Local endemics, as *Hemitrochus bowdenensis* may have been, will be more sensitive to environmental changes; when more widespread species undergo local extirpations, local endemics may undergo extinction. The forests of southeastern St. Thomas have been almost completely cut down and replaced by agriculture—degraded forest remains in only a very few areas. One wonders whether other extinct species may turn up in the recent fossil record in this area and other areas that have been similarly degraded.

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